Jail Robotics: The Wave of the Future

by Charles C. Plummer, Sheriff, Alameda County, California, and Ron Kolodzieczak, Sergeant, Detention and Corrections Division, Alameda County Sheriffs Department

On the morning of September 2, 1989, the first busload of forty-eight inmates left the old Santa Rita Jail en route to a new $174 million jail complex. Within two days, more than 2,100 inmates would be moved, and a county jail known as "one of the worst ten jails in the State of California" would close. The Alameda County facility had been the focus of numerous investigations of unconstitutional conditions, overcrowding, inadequate inmate supervision, and escapes. Finally, the opportunity for change had arrived.

The new Santa Rita facility, whose capacity is approximately 3,500 inmates, is laid out in a decentralized "campus" style, with buildings situated over an area one-half mile long and one-quarter mile wide. Its 850,000 square feet of building space is divided into three sections: eighteen self-contained housing units, a core building, and a service building. The service building contains, among other service areas, the laundry, commissary, warehouse, and the kitchen for inmate meals.

The new facility integrates the latest technology with operational procedures and has a goal of providing the safest, most efficient, and most effective handling of inmates possible. Because of the facility's size and the need to bring services to inmates, a key part of the facility's technology is a unique robotic service system. Called the Automated Guided Vehicle System (AGVS), the robotic system was chosen as a way to reduce both costs and inmate movement.

The Automated Guided Vehicle System

Although automated delivery systems have been used in manufacturing facilities, hospitals, and offices for more than three decades, they had never been used in a correctional setting. The system was designed by Apogee Robotics, Inc., and built and installed by Apogee in cooperation with Bechtel National, Inc. The Sheriff's Department jail planning staff and the Alameda County public works staff constantly monitored the system during construction.

The AGVS is designed to deliver from the service building to inmate housing units all inmate meals, laundry, commissary items, and supplies and to remove trash. The system consists of nineteen computer-driven, battery-powered vehicles that move 163 carts over 12,000 lineal feet of concealed guidepath at a speed that varies from one-half to three miles per hour, depending on path location. Three types of carts are used in the facility:

- Eighty food carts that can accommodate forty-eight hot food trays and forty-eight cold food trays and maintain proper food temperatures for thirty minutes;
- Fifty-five multipurpose utility carts designed to carry all types of supplies; and
- Twenty-five trash carts.

The carts are approximately five to six feet long, three feet wide, and five to six feet high; their weights range from 590 pounds (trash carts) to 1,190 pounds (food carts).

The system has been designed so that inmates and staff can operate it with minimal training by following a set procedure. Carts are positioned over an embedded floor reader, the operator uses a laser bar-code reader to choose the cart's destination, and the cart is pushed onto the dispatch station.

From that point the process is automatically controlled by a standard personal computer.

A vehicle arrives at the dispatch point, slips under the cart and raises it off its wheels, then carries it to its programmed destination and lowers it to the floor. The vehicle automatically returns to the battery-charging/storage area.

At the destination, an electronic sensor detects the cart and signals the housing unit of its arrival. Under staff supervision, inmates push the cart into the housing unit. When the cart has been unloaded, it is repositioned on the guidepath, where a sensor calls a vehicle to pick it up. A vehicle automatically arrives, determines what type of cart is being picked up, and returns it to the proper location.

The vehicles are designed to operate in all types of weather and can handle grades of 10 percent. Because the system must operate twenty-four hours a day, all system electronics are on backup power, and a backup computer is available, if necessary. Vehicles can also be dispatched manually through individual dispatch keypads. Because repairs must be accomplished quickly, parts are maintained in stock, and technicians, trained by Apogee staff, are always available.

Safety and Security Features

Because loaded vehicles must navigate in the minimum security yard with inmates present, safety and security have been a primary concern. All equipment and system elements were designed, constructed, and installed under extremely close scrutiny, and each item was subjected to severe testing by those assigned to the project. For example, jail personnel evaluated the strength of the vehicle shell by hitting it with a crowbar and a baseball bat. Additional safety and security features include the following:

- ***Obstacle detection*** **-** The vehicle automatically stops and sounds an alarm if it encounters an obstacle, e.g., a person standing in its track.
- ***Cart travel lock*** - During transport, the cart is automatically locked to the vehicle.
- ***Global recall button*** **-** All gate operators have access to a global recall button that immediately sends all vehicles back to the service area. This feature could be used in case of an emergency, such as a jail riot.
- ***Tamper proof features-*** Reinforced stainless steel construction with locked compartments resists vandalism and offers no access for contraband transfer. If a vehicle or cart is tampered with during transport, the vehicle's on-board audio alarm and aircraft strobe lights will automatically be activated.

The AGVS in the Santa Rita facility cost approximately $7 million, including carts. Systems for smaller facilities start at $300,000. The estimated payback time is three to four years; savings are measured in increased security and cart life, decreased staffing, and decreased facility damage.

To those considering a robotic service system for their facilities, we recommend that they first study their situation to determine exactly what the system would do. Once the project is under way, staff should monitor its progress during all stages, from design to final operation. Contractual agreements with vendors should include on-site staff training and assistance with operating the system for a defined period of time. Close inspection and evaluation is needed during the first weeks of operation to ensure that the system is working as designed.

The Alameda County Sheriff's Department is convinced that this type of operation offers significant opportunity for new and existing jails to reduce costs while enhancing service. Our system is reliable and functional, and in its first six months of operation it has never missed a meal. We believe that robotics is truly the wave of the future.

For further information, contact Sgt. Ron Kolodzieczak, (415) 551-6500. ■